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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B02C 19/00, 13/18

A1

(11) International Publication Number: WO 96/32196

(43) International Publication Date: 17 October 1996 (17.10.96)

(21) International Application Number: PCT/NL96/00153

(22) International Filing Date: 10 April 1996 (10.04.96)

(30) Priority Data:
1000116 11 April 1995 (11.04.95) NL

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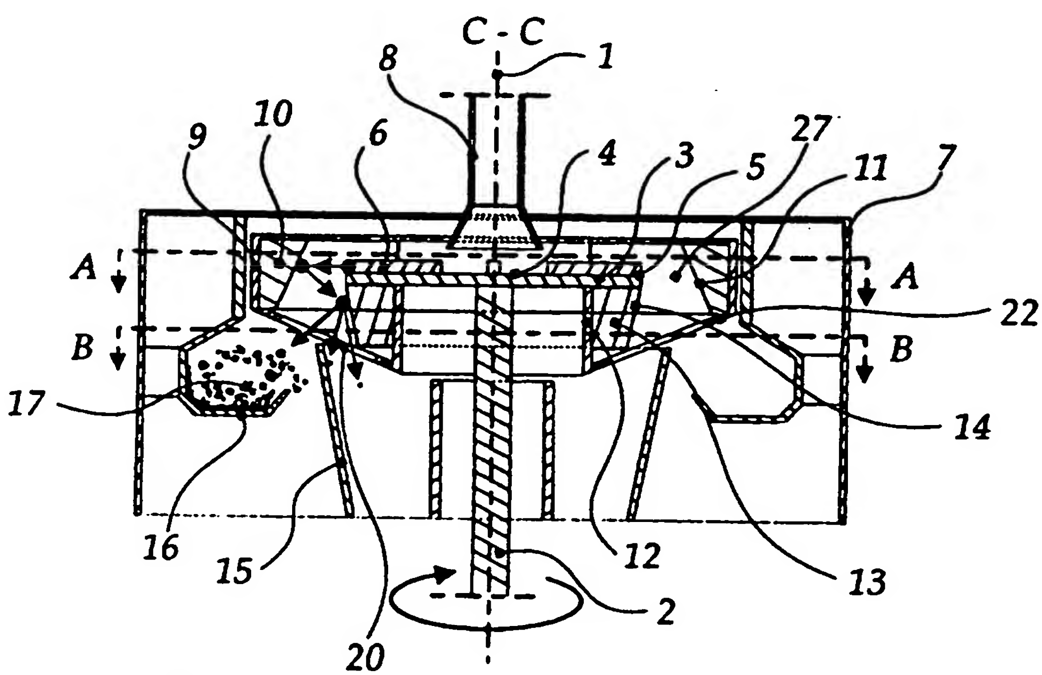
(81) Designated States: AU, BR, CA, JP, RU, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: COMBINED MULTIPLE IMPACT CRUSHER

(57) Abstract



A combined multiple impact crusher with which granular material is slung outward over the rim of the rotor blade (3), impacts against an armour-plating (10) which rotates jointly with the rotor blade and the impact surface of which is conical in shape, and is further conducted obliquely downward in the radial direction to a second armour-plating (13) which rotates jointly with the rotor blade and has a conically shaped impact surface disposed below the rim of the rotor blade, after which impact the coarse and the fine fraction of the fracture fragments which are produced during the impacts are mutually separated with the aid of a height-adjustable dividing screen (15) disposed around the impact surface of the sec nd armour-plating, after which the coarse fracture fragments, which are conducted over the rim of the dividing screen, are collected in an autogenous crush material belt in a trough construction (16) disposed around the dividing screen (15).

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COMBINED MULTIPLE IMPACT CRUSHER

TECHNICAL FIELD

The invention relates to an autogenous impact crusher having a dish-shaped rotor blade which is mounted rotatably about a vertical axis and is provided with shorter or longer guides which are made in straight, bent or buckled construction with a smooth steel guide face or are constructed as a cell-type bucket in which, whenever the rotor blade rotates, under the influence of centrifugal force, crush material pieces can settle and form there a natural guide face in their own right, which guides run from the middle portion, radially or non-radially directed, to the rim of the rotor blade, with which rotor blade granular material which is brought onto the middle of the revolving rotor blade is brought up to speed, under the influence of centrifugal force, along the guides, or through a type thereof, and is slung outward over the rim of the rotor blade and is subsequently conducted at high speed into a trough construction which is disposed around the rotor blade and in which crush material accumulates, whereby a belt of crush material builds up in the trough construction, into which crush material belt the crush material impacts and subsequently, as a result of collision and friction with other crush material pieces, in a so-called autogenous treatment process which is activated by the kinetic energy of the crush material grains which are conducted at high speed at an oblique angle into the crush material belt, is worked, i.e. re-treated, along the surface, whereupon the grains can fragment, thereby producing a crushed product offering a rounded grain figuration and a hard grain surface.

BACKGROUND ART

Autogenous impact crushers of this kind, which offer only a limited degree of size reduction and are primarily suitable for the re-treatment of previously crushed material, are known from American patent specifications 4,923,131 - 4,877,192 - 4,844,365 - 4,844,364 - 4,579,290 - 4,515,316 - 2,992,784 - 2,012,694, from British patent specification 376,760 and from European patent specifications 0342,216 B1, 0265,580 B1, 0187 252 A2 and 0074 771 A2.

The grains can develop on the rotor blade, along the guides, a radial velocity which is maximally equal to the tangential velocity conforming to the velocity along the outer rim of the rotor blade. The radial and tangential velocity components together determine the velocity vector and the fly-off angle of the granular material at the moment in which it leaves the rotor blade. Should the radial and tangential velocity be equal, the grains, at the moment in which they leave the rotor blade, exhibit a maximum vector velocity and the maximum fly-off angle of 45°. The tangential and radial velocity components amount in this case to around 70% of the vector velocity. Where the granular

material on the rotor blade develops less radial velocity, the fly-off velocity, i.e. the vector velocity, at which the grain leaves the rotor blade decreases and, as a consequence, the fly-off angle is more tangentially directed and less than 45°; and potential kinetic energy is therefore lost.

The known autogenous impact crushers have the problem that the granular material is conducted into the crush material belt in the horizontal plane from one specific direction, i.e. angle, it being desirable, for the satisfactory activation of the revolving motion of the grains through the crush material belt, that the grain material should be conducted into the crushing space at the shallowest possible angle., i.e. at an angle which is directed as tangentially as possible. The collision with the other grains consequently occurs at a fairly shallow angle, more or less from behind, against the material circulating through the crush belt, which is the reason why a large part of the kinetic energy which is introduced with the grains into the crush material belt is lost. The intensity of the autogenous treatment process in the known autogenous impact crushers is thereby limited. This is apparent from the low degree of size-reduction; which is the reason why this cannot actually be termed a size-reduction process, but rather an intensive re-treatment process for previously crushed material. As a result of collision and friction, the surface of the granular material is subjected to reasonably intensive re-treatment, thereby achieving a very good grain figuration, whilst the granular material, certainly along the surface, is selected for hardness; which re-treatment of previously crushed material gives rise to a crushed product offering very good grain figuration and a hard grain surface.

The greatest load upon a grain during impact is obtained when the impact is made at a load angle between 70° and 85°. The maximum fly-off angle of the grains from the rim of the rotor blade amounts under normal circumstances, as previously indicated, to 45°; in which case the impact of the grains in the crush material belt is made at an angle of about 45°. For the satisfactory activation of the autogenous treatment process, i.e. the revolving motion of the granular material through the crush material belt, and one which will prevent the impacting granular material, after impact, from being too much led back in the direction of the rim of the rotor blade, whereby the incoming granular material is slowed down before it reaches the crush material belt, whilst the rebounding material can create a high level of wear along the outer wall of the rotor blade, the crush material, in the horizontal plane, must be conducted into the crush material belt at the shallowest possible angle, preferably much less than 45°; which requires that the crush material should leave the rotor blade at a fly-off angle which is directed as tangentially as possible and at a vector velocity which is therefore less than maximal.

With the known autogenous impact crushers, a balance has to be weighed between a large fly-off angle and hence high vector velocity, the impact of the grains per se occurring at greater intensity, and a smaller fly-off angle and, as a consequence, lower vector velocity, at which the autogenous process as a whole is better activated and, moreover, the granular material is prevented from rebounding too much in the direction of the rotor blade. In practice, an impact angle in the crush material belt of about 30° is generally employed.

In the known autogenous impact crushers, this is realized by bringing the crush material on the rotor blade up to speed along guides which are heavily disposed from the radial direction more along the rim of the rotor blade and the guide face of which is made up of crush material pieces, and by conducting the said crush material to the rim of the rotor blade. The radial velocity which the crush material develops on the rotor blade consequently falls short of the tangential velocity, so that, at the moment in which the crush material leaves the rotor blade, the tangential velocity component is clearly predominant. Consequently, since the grains on the rotor blade are impeded in the development of the radial velocity, potential rotor energy, i.e. the energy which can be transmitted to the crush material via the rotor blade and the guides, is lost.

From American patent specifications 5,131,601 - 4,896,838 - 4,659,026 - 4,577,806 - 3,970,257, from European patent specifications 0187 252 A2 and 0101 277 A3 and from patent application PCT/WO/89/04720, rotor blade constructions of this kind are known in which the guides, in the form of cell-type buckets, are placed more towards the rim of the rotor blade. In the paper by Hamer, M.D. entitled "The Barmac Autogenous Crushing Mill" from the AusIMM Annual Conference, 1990, the fly-off angle of such a rotor blade construction is calculated at 28° in the tangential direction.

In the case of this known rotor blade construction, it is indicated that the autogenous treatment process, resulting from the collision and friction of the crush material grains, is already initiated on the rotor blade, in and along the cell-type buckets. Along the cell-type buckets with the known rotor blade construction, the material is only however brought up to speed; there is no question here of intense collision or other type of contact, whilst the dwell time of the grains on the rotor blade is limited to just a few seconds. It may be assumed that the intensity of the autogenous treatment process on the rotor blade is limited and does not compensate for the loss of potential radial velocity.

Besides the requirement that, in the horizontal plane, the crush material must be conducted into the crush material belt at a shallow angle, the preference in the vertical plane is that the crush material should be conducted into the crush material belt at an angle which is somewhat slanted from above, whereby the granular material impacts into the bottom of the crush material belt and is conducted from there towards and along the rear wall, thereby giving rise to an intensive re-treatment process whenever the

granular material is conducted horizontally into the crush material and impacts against the vertical rear wall of the crush material. A downward slanted impact angle of this kind cannot however be realized with the horizontally disposed rotor blade.

DISCLOSURE OF INVENTION

The object of the invention, by combining the size-reduction and the autogenous re-treatment processes for the crush material in a single installation, is to separate the fine and the soft components from the crush material before the crush material, for autogenous re-treatment, is conducted at an optimal angle into the crush material belt, thereby making better use of the radial velocity component - and hence of the rotor energy -, whilst the combination of the size-reduction and autogenous re-treatment processes in a single crusher, and sizeable energy savings, so become possible.

To this end, the invention envisages that the radial and the tangential component of the velocity vector exhibited by the crush material at the moment in which it leaves the rotor blade shall be applied separately; the radial velocity component being used to reduce the size of the material by means of impact loading against a steel surface, after which the crush material, with a velocity vector which is composed of the original tangential velocity component which at that moment is still entirely active and that portion of the radial velocity component which, after the impacts, is still partially active at that moment, is conducted at an optimal angle into a crush material belt for autogenous re-treatment. This is achieved by making the crush material, after it leaves the rotor blade, first impact against the impact surfaces of two armour-platings rotating jointly with the rotor blade, for which purpose an armour-plating, with the impact surface directed inward, is disposed radially around the rotor blade and an armour-plating, with the impact surface outward, is disposed radially below the rim of the rotor blade, after which the fracture material is conducted from the impact surface of the second armour-plating along a dividing screen by which the fine fraction is separated from the fracture material, so that only the coarse fraction of the fracture material is conducted into the crush material belt for autogenous re-treatment.

The impact surfaces of the armour-platings are made in straight construction in the vertical radial plane and are arranged at an angle. The angles which are made by the impact surfaces of the armour-platings in the vertical plane and the level at which the armour-platings are situated around and below the rotor blade are in this case chosen such that as a whole, having left the rotor blade, the individual crush material pieces in the vertical plane, viewed from the revolving crusher, each pass through a downwardly directed zigzag-shaped, multiple-impact path, the impact angles forming an optimal load angle, i.e. between 70° and 85°, in relation to the impact surface; whereby the crush material not only makes impact at an optimal load angle, but also, in quick succession, is

subjected to multiple loads, giving rise to high fracture probability, whilst the motion of the crush material pieces and the resultant fracture fragments runs through the crushing space, viewed from the rotating position, in a vertical plane. The effect of this is that the individual crush material grains do not obstruct one another as they move through the crushing space and as they impact against the impact surfaces of the armour-platings; and that the crush material pieces each pass through a geometrically identical, multiple-impact path, whereby the wear is limited and a crushed product of constant quality is produced, whilst the soft components of the crush material are completely pulverized during this process.

When the crush material leaves the rotor blade, the grains each exhibit a velocity vector made up of a tangential and a radial velocity component. Where it is assumed that the tangential and the radial velocity component are equal, the fly-off angle from the rim of the rotor blade measuring 45°, these velocities each amount to around 70% of the vector velocity. During the impacts against the jointly rotating armour-platings, only the radial velocity component is utilized. Following the impacts, in the crush material a velocity vector is active which is made up of the original tangential velocity component and the remnant, after impact, of the radial velocity component. This velocity vector is greater per se than the radial velocity component with which the material has impacted against the steel impact bars of the armour-platings.

In the horizontal plane, the fly-off angle is heavily tangentially directed, at 20° to 25°, whilst in the vertical plane the crush material moves in a downward slanted track.

Prior to the crush material being conducted into the crush material belt, the fine parts, including those soft components which have been pulverized during impact against the armour-platings, are separated as much as possible from the crush material. To this end, the invention envisages that obliquely along the bottom of the impact surface of the armour-plating, in the plane along which the fracture material is further conducted after impact, and hence between the impact surface of the second armour-plating and the surrounding crush material belt, there is placed a dividing screen which is adjustable in height and may or may not rotate jointly with the rotor blade. Because the coarse grains of the crush material have a larger rebound angle and consequently rebound in a more horizontal direction than the finer grains having a smaller rebound angle and, after impact, are conducted into a more downwardly directed track, the fracture fragments form in the rebound direction a sort of fan, with the coarse parts at the top of the fan and the fine parts at the bottom of the fan. By now placing the dividing screen with its top rim in the fan of the fracture fragments, the fine parts are able to be separated from the coarse parts, the dividing boundary being able to be regulated by adjusting the height of the dividing screen. Only those parts which pass over the rim of

the dividing plane, i.e. the coarse fraction of the fracture material, are conducted into the autogenous process; to be precise, as has been indicated, with a velocity vector which is made up of the original tangential velocity component and the residual portion of the radial velocity component. Since the tangential velocity component is predominant, the rebound angle of the fracture fragments in the horizontal plane is heavily tangentially directed, whilst in the vertical plane the particular motion is directed somewhat downward, whereby the crush material as a whole is conducted at an optimal angle into the crush material belt and is there re-treated.

The invention envisages the possibility that the crusher shall be equipped with a single jointly rotating armour-plating, which is disposed around the rotor blade, the crush material being conducted for autogenous re-treatment via this armour-plating into a crush material belt which is disposed below the rim of the rotor blade with the opening now directed outward, an annular dividing plane being placed between the impact surface of the armour-plating and the crush material belt, so that only the coarse fraction is conducted into the crush material belt.

The invention further envisages that the armour-platings shall be independently or jointly adjustable in relation to the rotor blade, both in the vertical direction and rotatably, so that wear to the armour-platings can be distributed as evenly as possible along the impact surfaces.

In order to limit the influence of the air currents, which can affect the motion of the crush material pieces, the invention envisages that the rotor blade and the surrounding armour-platings shall be fitted in a housing which rotates jointly with the rotor blade and armour-platings and is in the shape of a flat drum having, in the middle of the top face, an opening through which the crush material is brought onto the middle part of the rotor blade with the aid of a stationary feed hopper, the said flat drum being provided in the bottom face with outlet openings situated below those points on the rim of the rotor blade along which the crush material leaves the rotor blade, whilst the crushing space is divided into a number of chambers by means of partition screens, which are disposed between the guides and run into the bottom of the crushing space, so that, as a whole, the generation of air movements is as far as possible deterred. The dividing screens are fitted such that the height adjustment and rotatable adjustment of the armour-platings in relation to the rotor blade is not impeded. The dividing screen can be fitted in or below the drum so as to rotate jointly with the rotor blade, or can be fixedly disposed.

The invention further envisages the possibility that guides shall be constructed radially and symmetrically on the rotor blade, thereby giving rise, as a whole, to an impact crusher having a symmetrical design, whereby the impact crusher can operate both in left-turning and right-turning mode, thereby producing a regular wear pattern.

A combined impact crusher of this kind has the advantage that the rotor energy and the resultant radial and tangential velocity components of the velocity vector exhibited by the material at the moment in which it leaves the rotor blade are each separately and optimally utilized, the material being conducted into the crush material belt at sufficient velocity and at the most favourable possible angle, whilst only a limited quantity of fine parts make their way into the crush material belt. The concept of the combined impact crusher allows a very compact design.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1. Shows a heavily diagrammatized cross-section through the combined multiple impact crusher, in which the most important components are indicated.

Figure 2. Shows a longitudinal section through the combined multiple impact crusher according to Figure 1.

Figure 3. Shows a longitudinal section through the combined multiple impact crusher according to Figure 1.

Figure 4. Shows a heavily diagrammatized cross-section through the combined multiple impact crusher, equipped with one armour-plating, in which the most important components are indicated.

Figure 5. shows the angle (α) made by the first armour-plating in the vertical plane.

Figure 6. shows the angle (β) made by the second armour-plating in the vertical plane.

DETAILED DESCRIPTION

Figure 1 is reproduced twice so that the respective longitudinal sections can be better read. Figures 1 to 3 depict a crusher housing (7) in which the rotor blade (3) is disposed centrally in the middle. The granular material is metered out through the inlet (8) in the middle (4) of the rotor blade (3) and from there is brought up to speed, under the influence of centrifugal force, along the guides (6), after which the granular material is slung outward at high speed over the rim (5) of the rotor blade (3).

The granular material subsequently impacts against the impact surface (11) of a flat armour-plating (10) which is disposed around the rotor blade (3) and rotates jointly with the rotor blade (3), which armour-plating is constructed as a downward-widening conical ring, the angle (α) of the impact surface (11) of which in the vertical plane is chosen such that the impact is made at a load angle between 70° and 85°; at which angle (α) the impact surface (11) of the first armour-plating (10) is arranged. The jointly rotating impact surface (11) allows use to be made solely of the radial velocity component of the velocity vector which the material exhibits at the moment in which it leaves the crushing space. Viewed from the jointly rotating position, this involves a

radially issuing motion of the granular material from the rim (5) of the rotor blade (3), so that the impact against the impact surfaces (11) of the impact bars (10) is also made radially, and the granular material, after impact, rebounds again in the radial direction and obliquely downward. The granular material is now collected by the impact surface (14) of a second armour-plating (13), the angle (β) of which in the radial plane ranges between 70° and 110°, which angle is chosen such that the impact is made at the most favourable possible load angle between 70° and 85° and the granular material is conducted onward in a radially outward direction and onward in a vertical plane downward. The rotor blade (2) and the two armour-platings (10; 13) can be disposed in the crusher housing (7) in a jointly rotating crushing space (9) surrounding the rotor blade (3) and the two armour-platings (10; 13). This produces a dish-shaped, closed crushing space (23), which is particularly favourable in aerodynamic terms whenever the whole rotates at high velocity. In the middle of the top plate (24) of the rotating crusher space (23) there is an opening (25) in which a stationary shell (8) is freely suspended, through which opening the granular material is metered out onto the middle part (4) of the rotor blade (3). In the oblique bottom plate (22) along the bottom of the rim of the rotating crusher space (23) which closes off the space below the two impact rings (10; 13), there are openings (20) through which the fracture fragments leave the rotating crushing space (23). These openings (20) are situated below those points along which the granular material leaves the rotor blade (3), i.e. below the ends of the guides (6). For a good wear distribution, it is necessary that the armour-platings (10; 13) should be adjustable both in height and rotatably in relation to the rotor blade (3).

In order to limit the air movements in the crushing space (23) of the rotating crusher housing (9), dividing screens (21) can be disposed between the guides (6), which dividing screens run through into the bottom of the crushing space (23), thereby dividing the crushing space (23) into a number of crushing chambers, one per guide (6).

When the crush material leaves the rotating crusher housing (9) through the openings (20) in the bottom plate (23), the material still retains a considerable velocity; the tangential velocity component is still fully intact, likewise a portion of the radial velocity component. Viewed now from the stationary position, the granular material moves outward at a fairly tangential angle of between 20° and 30°, measured in the horizontal plane, whilst the motion is somewhat slanted downward. On the outside, along the bottom of the rotating crusher housing (9), there is now disposed a dividing screen (15). The fracture material can now roughly be classified, since the grains, when they fragment, develop a specific rebound pattern in the shape of a sort of fracture fragments fan, with the coarse fraction, and the uncrushed or only partially crushed grains, at the top of the fan, and the fine fraction more at the bottom of the fan. The coarse fraction is now conducted over the dividing screen (15) into the trough

construction (16), in which the granular material develops a crush material belt (17) against which the further granular material which is conducted into the trough construction (16) impacts and, as a result of collision and friction with other grains, partially fragments, but, above all, is worked along the surface. The material is thereafter conducted outward over the rim of the trough construction (16) and collected in the bottom of the crusher.

CLAIMS

1. Combined multiple impact crusher having a dish-shaped rotor blade which is mounted rotatably about a vertical axis and is provided with shorter or longer guides which are made in straight, bent or buckled construction with a smooth steel guide face or are constructed as a cell-type bucket in which, whenever the rotor blade rotates, under the influence of centrifugal force, crush material pieces can settle and form there a natural guide face in their own right, which guides run from the middle portion, radially or non-radially directed, to the rim of the rotor blade, with which rotor blade crush material which is brought onto the middle of the revolving rotor blade is brought up to speed, under the influence of centrifugal force, along the guides, or through a type thereof, and is slung outward over the rim of the rotor blade and is subsequently conducted at high speed into a trough construction which is fixedly disposed around the rotor blade and the open side of which is directed inward, in which trough construction, against the bottom and the rear wall, there forms a crush material belt against which the material impacts and in so doing, as a result of collision and friction with other crush material, is worked, **characterized in that** the trough construction (16) forms with the crush material belt (17) a second size-reduction zone, which is preceded by a first size-reduction zone by virtue of the fact that between the trough construction (16) containing the crush material belt (17) and the rim (5) of the rotor blade (3) there are disposed two armour-platings (10; 13) which rotate jointly with the rotor blade (3), respectively with the impact side (11) directed inward around the rotor blade (3) and with the impact side (14) directed outward below the rim (5) of the rotor blade (3), which armour-platings (10; 13) have conically formed impact surfaces (11; 14) against which the granular material, after being slung outward over the rim (5) of the rotor blade (3), successively twice impacts, during which impacts the granular material is reduced in size, after which only the coarse fraction of the crushed material is conducted into the crush material belt (17) which forms in the trough construction (16), which trough construction, with the opening directed inward, is disposed around the outside of the impact surface (14) of the second armour-plating (13).

2. Combined multiple impact crusher according to Claim 1, **characterized in that** the angle (α) formed by the impact surface (11) of the first armour-plating (10) in the radially directed vertical plane ranges between 70° and 85° in relation to the axis (1) of the rotor blade (3).

3. Combined multiple impact crusher according to Claims 1 and 2, **characterized in that** the angle (β) formed by the impact surface (14) of the second armour-plating (13) in the radially directed vertical plane ranges between 70° and 110° in relation to the axis (1) of the rotor blade (3).

4. Combined multiple impact crusher according to Claims 1 to 3, **characterized** in that the impact surfaces (11; 14) of the armour-platings (10; 13) are made of steel.

5. Combined multiple impact crusher according to Claims 1 to 4, **characterized** in that between the impact surface (14) of the second armour-plating (13) and the trough construction (16) there is placed a conical dividing screen (15) which is adjustable in height parallel to the axis (1) of the rotor blade (3).

6. Combined multiple impact crusher according to Claims 1 to 5, **characterized** in that the armour-platings (10; 13) are jointly or separately adjustable in height parallel to the axis (1) of the rotor blade (3).

7. Combined multiple impact crusher according to Claims 1 to 6, **characterized** in that the trough construction (16) is adjustable in height parallel to the axis (1) of the rotor blade (3).

8. Combined multiple impact crusher according to Claims 1 to 7, **characterized** in that the crusher is equipped with a single armour-plating (10), which is disposed around the rotor blade (3), the trough construction (25) being disposed, for the autogenous re-treatment, below the rim (5) of the rotor blade (3) with the opening directed outward.

9. Combined multiple impact crusher according to Claims 1 to 8, **characterized** in that the rotor blade (3) and the armour platings (10; 13) are fitted in a housing (9)(23) which rotates jointly with the rotor blade (3) and armour-platings (10; 13) and is in the shape of a flat, dish-shaped drum having, in the middle of the top side, an opening through which the crush material is metered out to the middle part (4) of the rotor blade (3) and having in the bottom (22)(24) a number of openings (20)(26) along which the material from the rotating crushing space (27; 28) is conducted, which openings (20)(26) are situated below those points on the rim (5) of the rotor blade (3) along which the crush material leaves the rotor blade (3).

Fig. 1

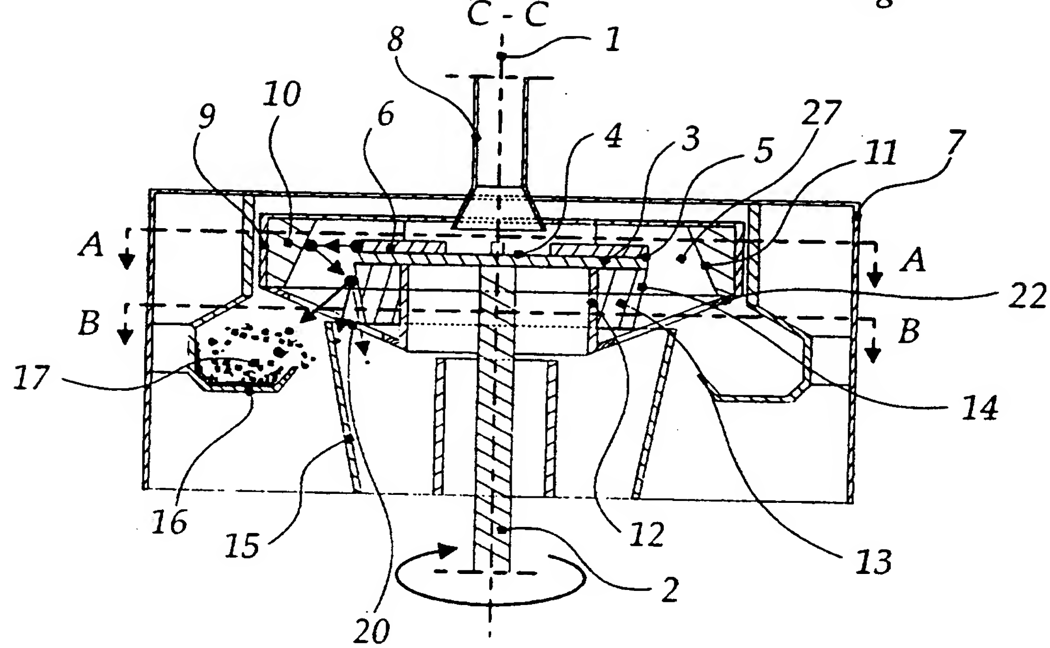
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Fig. 2

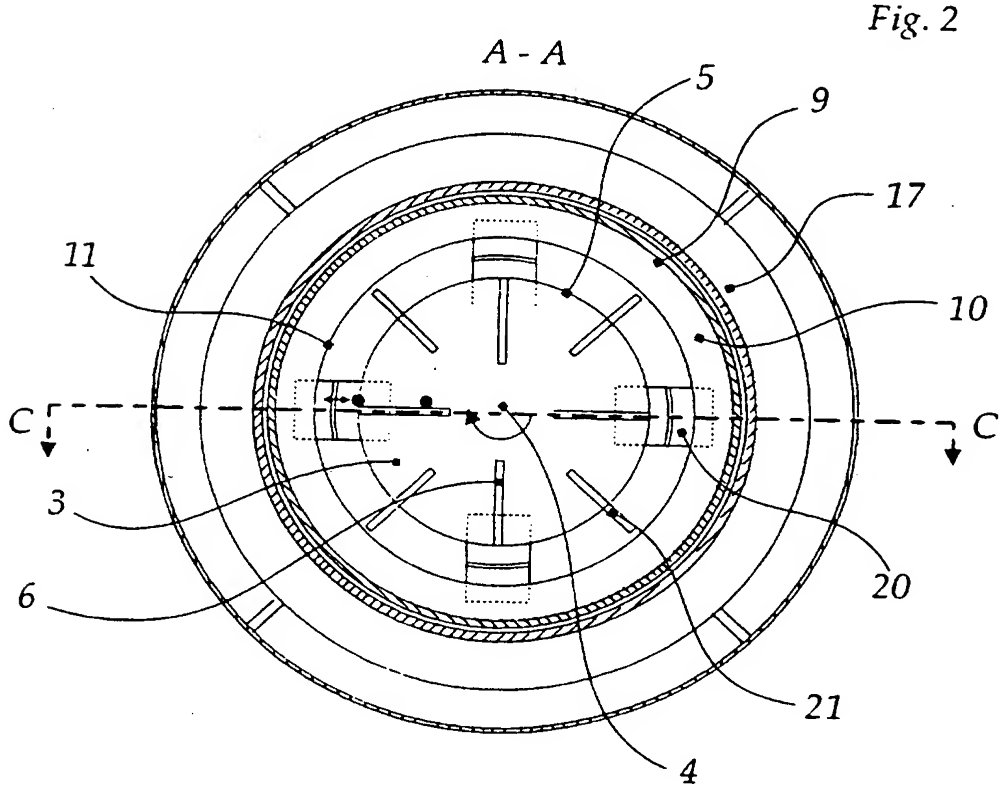
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Fig. 1

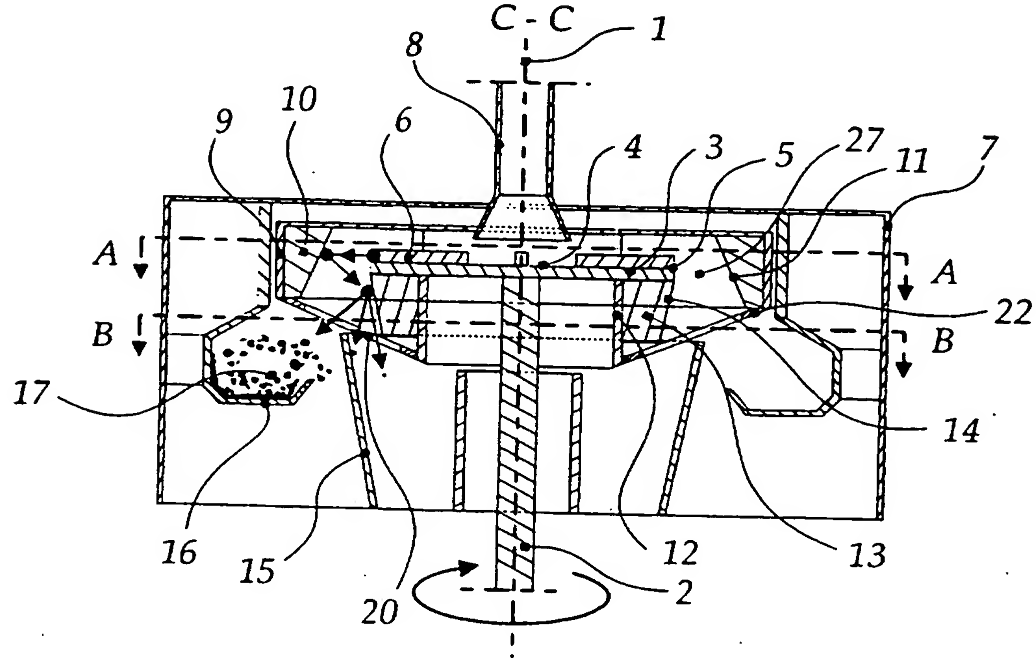
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Fig. 3

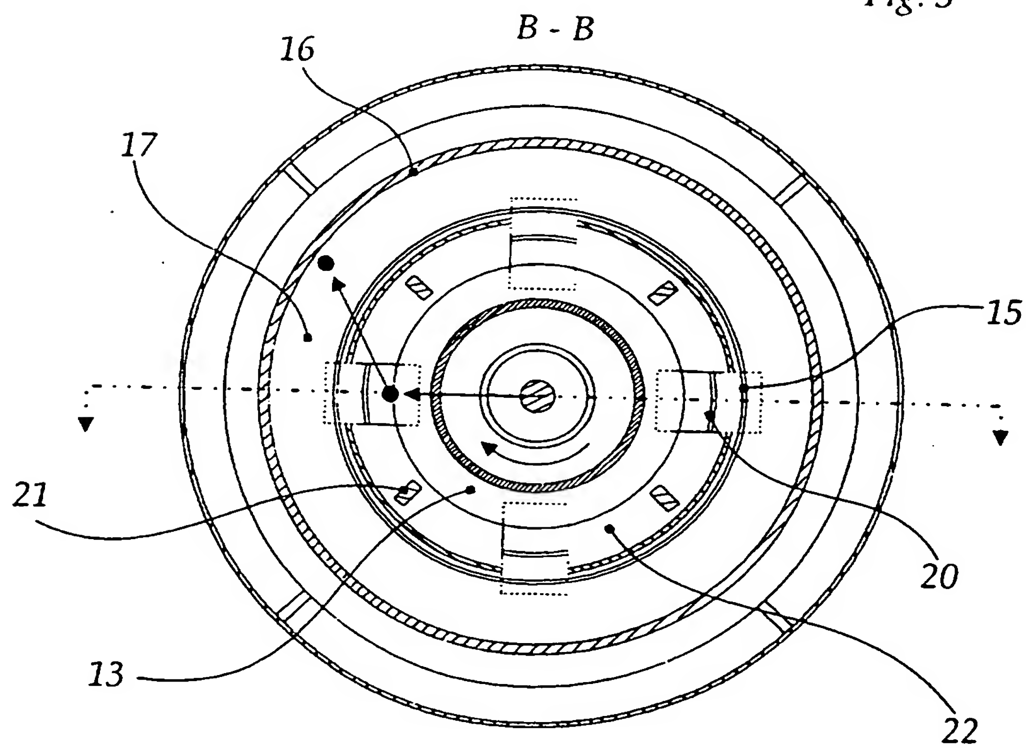
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Fig. 4

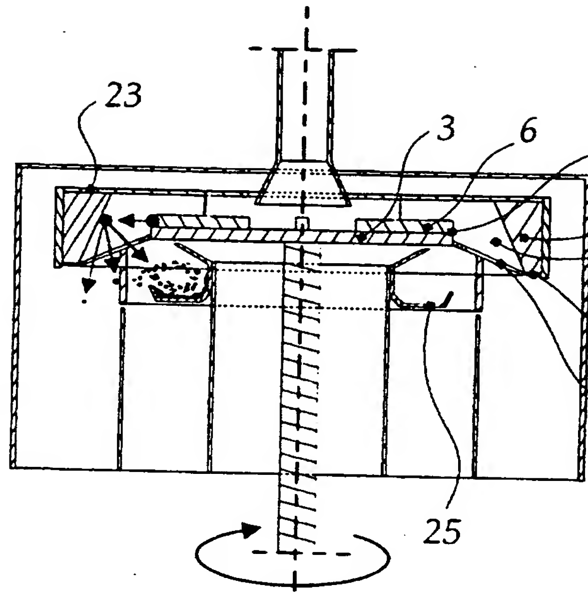


Fig. 5

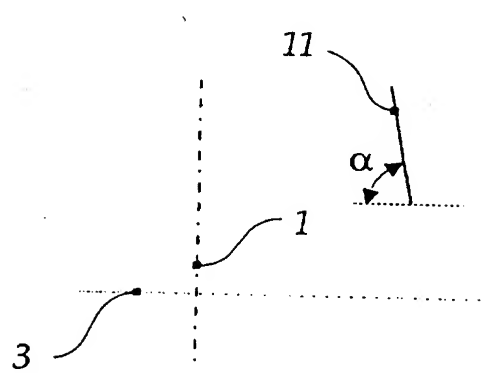
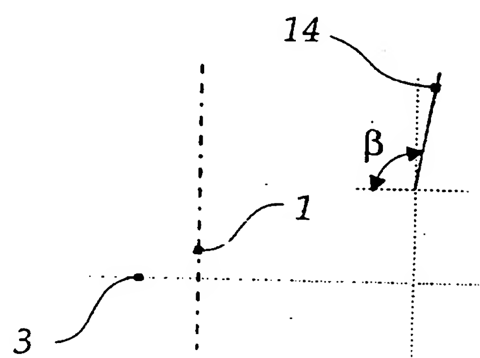


Fig. 6



INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 96/00153

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B02C19/00 B02C13/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B02C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,2 919 864 (B.J. PARMELE) 5 January 1960 see column 2, line 67 - column 5, line 26; figure 4 ---	1,7
A	US,A,4 844 354 (T. WATAJIMA) 4 July 1989 see abstract; figure 1 ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 334 (C-0742), 18 July 1990 & JP,A,02 122841 (KURIMOTO LTD), 10 May 1990, see abstract --- -/--	1

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
15 July 1996	22.07.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Verdonck, J

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ISDOCID: <WO___9632196A1 1 >

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 436 (C-1096), 12 August 1993 & JP,A,05 096194 (NAKAYAMA TEKKOSHO:KK), 20 April 1993, see abstract	1
A	DE,U,93 08 860 (H. DICHTER; H. VAN DER ZANDEN) 20 October 1994 see the whole document	1-3,6

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NSDOCID: <WO 9632196A1 I >

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/NL 96/00153

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-2919864	05-01-60	NONE		
US-A-4844354	04-07-89	DE-A-	3821360	14-09-89
		GB-A,B	2215237	20-09-89
DE-U-9308860	20-10-94	NONE		

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